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CONCERNING EARTHQUAKES.

BY A LATE RESIDENT IN TOKYO, JAPAN.

EARTHQUAKES are popularly regarded as among the most terrible visitants that bring destruction on man.

The wild wind and the remorseless dash
Of billows

have probably destroyed more human life; but they can to a certain extent be eluded. The man who ventures not upon the deep has little to fear from the hurricane; but from the dire earthquake there is no escape. It comes and goes, mocking at our *terra firma*, and ruthlessly laying low our loftiest towers. The fiercest storm heralds its approach by goats' beards of cirrus cloud and a falling barometer. But the earthquake has no sure heralds; and the scientific man is baffled in all his attempts at prognostication. It is this mysteriousness, this apparent free-will, that add to the terror of its visitations.

Even in countries where earthquakes, though frequent, are rarely disastrous, there is an *uncanniness* which experience never lives down. Indeed, it is all the other way, as most residents in such countries can testify. Familiarity does not in this case breed contempt. The gentlest rumbling has been known to develop suddenly into a terrific shaking; and who knows but what this particular tremor may so develop? Anything is possible; everything is uncertain. We have met with some, it is true, who have claimed a prophetic instinct in the matter, who have maintained that they always felt peculiarly nervous an hour or two before an earthquake came. It is not a little curious, however, that no person of scientific training has ever claimed such foreknowledge. Further, it was always after the earthquake had come and gone that we heard such phrases as, 'I was sure an earthquake was coming;' or, 'That explains my nervousness to-day.' On one occasion, about two hours before quite a lively shake, one *soi-disant* prophet boldly

declared there would be no earthquake that night, because he lacked the peculiar sensations. Whatever may be claimed in the matter, however, one thing is certain—no person has ever warned a community of the approach of an earthquake; and till such a benefactor has arisen, earthquake visitations will be as wayward as human fancies themselves.

Science has nevertheless taught us much concerning our earth-shakings, especially during the last twenty or thirty years. More particularly has our knowledge of small earthquakes been considerably extended; while many old theories have been exploded, and some new ones have been advanced. And yet the grand problem of the origin of earthquakes remains essentially unsolved. There is no doubt, of course, that an earthquake must originate in an explosion, or a crack, or a disturbance of some kind, in the body of the earth. But what is the cause of the disturbance itself? Is it simply a loosening of rocks in the neighbourhood of cavities, or is it a chemical reaction, or a sudden evolution of steam caused by water coming into contact with molten rock? There are a great many facts that point to water and steam as important agents in the origin of earthquakes. One of the most suggestive of these is the contiguity of earthquake districts to the sea. Furthermore, earthquakes frequently have their origin just off the coast below the ocean bottom.

Now, if we consider the significance of a shoreline, we shall easily recognise the probability of neighbouring districts being seismically sensitive, as it might be termed. Seawards, the land slopes down till in some regions it is nine or ten miles lower in level than the heights that lie landwards. If the solid crust of the earth were to become fluid, it would at once flow down from its elevated parts until all became reduced to the same level. As it is, however, its rigidity sustains it; but none the less will there be a tendency, under the action of gravity, towards a general levelling. There must therefore exist in the intermediate districts lying near to the

shore-line a severe straining; so that the very irregularity of the land contour gives all the conditions favourable for the production of snaps and tremors in a material as intensely heterogeneous as we know the earth's crust to be. When such facts and possibilities are given their full weight, the surprise is not that there are earthquake districts here and there on the margins of continents, but that there are not more of them.

We have just pointed out that in the irregularity of distribution of the earth's solid matter we have a sufficient explanation of the existence of these seismically sensitive regions. But there is a very old theory of the cause of earthquakes which still has credence in some quarters, but which physically has not a leg to stand on. Error, indeed, always dies hard; and in this case not a few facts, real or supposed, seemed to find a ready enough explanation. For instance, the lava that streamed from volcanoes suggested oceans of molten rock many miles down below the earth's surface. The known increase of temperature as we descend into the earth's crust lent a powerful support to this view. Thereupon followed the theory that, just as the moon's gravitational action caused tides on the surface oceans of water, so would it produce tides in the subterranean ocean of lava. These bearing upon the lower surface of the crust would cause ruptures with tremors and earthquakes, or would find outlet by lava streams through volcanoes. Now, to establish this, it was obviously necessary to submit earthquake statistics to a severe examination, so that haply there might be discovered therein a periodic variation in frequency following some lunar periodicity. This was the problem which Professor Perrey of Dijon set himself to solve nearly fifty years ago. By an elaborate manipulation of statistics, he concluded that earthquakes were more frequent at new moon and full moon than at half-moon; more frequent at new moon than at full; more frequent when the moon was nearest the earth than when it was farthest away; more frequent at times of meridian passage of the moon than at other times. For the last twenty years these calculations by Perrey have been discredited for various reasons. His catalogue of earthquakes was far from complete, since it took no account of the innumerable small earthquakes of the kind that are almost hourly being registered by the delicate seismographs of to-day. Further, the differences in the frequencies on which he based his conclusions were all very small; and it is now generally admitted that, rationally interpreted, the statistics point to no excess of frequency at new moon, or at perigee, or at meridian passage. Very recently, M. De Ballore, a Swiss captain of artillery, has with much fuller statistics treated the last-named relation (if any) between earthquake frequency and lunar culminations. His conclusion is a negative one.

Now that we know more about the structure of the earth, we are not surprised that Perrey's supposed relations do not hold. G. H. Darwin's refined calculations have fully established Sir William Thomson's earlier conclusion, that our earth as a whole is as rigid as an equal-sized

globe of steel. This rigidity is quite inconsistent with the hypothesis of an ocean of lava spread out under a comparatively thin crust of solid material. The crust of the earth is a phrase still in common use; but it cannot now be taken as implying an under-stratum of molten rock. It simply means that part of the earth which is accessible to us. Of the deeper parts we know nothing definite, except that they are to a depth of several hundred miles at least essentially solid, being so kept, in spite of the high temperature, by the pressure of the superincumbent mass. Probably the structure of the earth is very heterogeneous, perhaps full of cavities containing semi-fluid material. It is quite possible, also, that tidal *strainings* may exist within the earth; but this is a very different thing from the subterranean tides whose assistance was invoked by the earlier seismologists.

Before passing to the discussion of other possible seismic influences, it will be well for us to consider some of the characteristics of earthquake motions. We do not refer so much to those terrible shakings which destroy towns, open chasms, and devastate a country. Terrible and heart-thrilling though these are, they are ill adapted for scientific study. Only very general ideas as to the nature of the motion can be obtained either from the recollection of the survivors of the catastrophe or from the character of the havoc wrought. Such a seemingly simple problem as the finding of the impulse that will level a wall is still far from being solved. At present, then, we rather refer to those small earthquakes which do little damage, but which can be recorded and even measured on suitable instruments.

An instrument for recording earthquakes is called a seismograph; an instrument for measuring them is called a seismometer. There are many kinds of the former class of instrument, all more or less useful in their way; but evidently the seismometer is a much higher grade of instrument, since it gives us the means of comparing the intensities of earthquakes occurring at different times. When, nearly twenty years ago, the Japanese government invited the aid of scientific men of other countries, it was fortunate in attracting to its shores some enthusiastic Britons, whose united labours led to the evolution of a trustworthily seismometer. Japan was one of the few countries where continually recurring earthquakes of small intensity could be studied with ease; and Professors Milne, Gray, and Ewing, building on the foundations of their predecessors in seismology, and working more or less independently, speedily devised instruments capable of giving continuous and complete records of earthquake motions. From these records the whole circumstances of the motions can be accurately worked out at leisure.

We do not purpose at this time to enter into a description of these seismometers. It is sufficient here to know that with such instruments motions amounting only to the five-hundredth part of an inch can be registered and measured. When the motion of the ground amounts, say, to half an inch, there is great risk of these delicate seismometers being thrown off their bearings. For larger earthquakes, therefore, less delicate seismometers must be constructed. A seis-

seismological observatory should contain, indeed, a variety of instruments for recording the whole range of earth-shakings from the feeblest tremor up to earthquakes that fall just short of disaster. Observations, approaching more or less closely to this ideal state of equipment, exist in various parts of the world; and from their cumulated material we may hope in time to gather important information as to the distribution and relative frequency of earthquakes at different localities.

There is, so far, only one law of frequency that has unmistakably declared itself. It is usual to call it the annual periodicity; but, as will be shown immediately, seasonal periodicity is much the better name. Broadly stated, the fact is that in winter there are more earthquakes than in summer. For example, in Japan, the liveliest earthquake months are generally between January and May; while in Chili and in New Zealand, the maximum frequency occurs between June and September, that is, in their winter. In tropical districts like Java and Sumatra, there is no marked winter maximum, and we know that there is no marked winter. These facts are very instructive; and their significance was first fully discussed by Professor C. G. Knott in a paper on 'Earthquake Frequency' published in the Transactions of the Seismological Society of Japan.

Now, in inquiring into the possible causes of this seasonal periodicity, we must bear in mind that the sun is the great ruler of the seasons; consequently, we may possibly have to look to some solar phenomenon or effect, which, though timing with the seasons, may not be of necessity involved with them. For example, as the sun's distance from the earth changes from its smallest magnitude to its greatest in half a year, its tidal straining on the solid material of the earth passes from its maximum to its minimum. For the nearer the tide-producing body to the earth, the greater the tide or the tidal stress. The sun is nearest to the earth in December, so that if earthquake frequency should depend on this 'annual tide,' we should look for a maximum frequency in our winter.

We have no right to expect the effect to be contemporaneous with the imagined cause; for in many natural phenomena effects distinctly lag behind their causes. For example, our warmest summer weather is much later than the longest day when the sun attains his highest altitude. So in the case under discussion, a month or two may well elapse before the seismic influence of the maximum tidal stress can assert itself. Now, as already noticed, it is in winter that earthquakes do attain their maximum frequency. But it is in the *local* winter; and consequently we must abandon the suggested hypothesis. For, although in the northern hemisphere the maximum frequency does really occur when the sun is near its perigee, yet in the southern hemisphere the maximum frequency occurs when the sun is near its apogee.

It is evident, in fact, that we have to look to some influence depending upon what astronomers call the declination of the sun—that is, its position north or south of the equator. Now, the most obvious phenomenon attending the sun's march from solstice to solstice is, of course, the alterna-

tion of heat and cold. But a little consideration will show that this phenomenon can hardly have any direct influence upon the frequency of earthquakes. The annual variation of temperature at the earth's surface is not perceptible at a depth of fifty feet, while we are certain that the great majority of earthquakes originate in regions several miles below the surface. In addition to the broad temperature changes we have, further, the various climatic conditions as to rain, wind, storm-tracks, and atmospheric pressure. To what extent may we connect these periodic factors with earthquake frequency? Professor Milne has subjected the Japanese earthquakes to a searching analysis, grouping them under high barometer, low barometer, rising barometer, falling barometer, strong winds and calms, and so on; and in no case was he able to establish any relation. If such meteorological phenomena are to have any effect at all, it must, in short, be in virtue of their annual or long-period variations. As soon as the full significance of this statement is realised, we have not far to seek for a real cause. We may find it in the accumulation of snow over continental regions, adding to the pressure on the land. In this way the straining effect existing along the shore-line may be increased, so that the seismically sensitive region may yield most frequently during the winter months. Or we may find it in the great annual see-saw of barometric pressure over land and sea. In the warm summer weather the land surface becomes strongly heated as compared with the ocean surface. The result of this is that the atmospheric pressure over the ocean is somewhat greater on the average than the pressure over the land. As the winter comes on, the land surface cools until in temperate regions it becomes on the average colder than the sea. As a result, the atmospheric pressure over a continent becomes considerably greater than over the contiguous ocean. It should be noted that this see-saw of pressure is not perceptible in tropical regions, exactly where, as we have seen, there is no distinct seasonal periodicity in earthquakes. Here, then, we have a meteorological phenomenon with a seasonal periodicity of identically the same character as the annual variation in earthquake frequency. We do not mean that this winter accumulation of pressure over land areas causes earthquakes; but that, given the seismically sensitive region separating land and ocean areas, it may well be enough to accelerate the occurrence of those yieldings or snappings or explosions which are among the real origins of earth-shakings. In this sense we may regard snow accumulations and barometric gradients as real seismic factors.

These conclusions are based on statistical averages; and when we speak of a winter maximum of frequency we do not mean that the greatest earthquakes tend to occur in winter. Terrible disasters like that which visited the south shores of Japan in October of last year must be regulated—if we may use the expression—by conditions that depend wholly upon the internal structure of the earth. This earthquake was the most violent that had visited Japan for thirty-seven years. It was felt over the greater part of the main island; and, from the destruction caused to railways and telegraphs, it was some days before it was generally known how

terrible had been the shock in the populous provinces of Mino and Owari. This region lies about forty miles to the south-east of Kyoto. Here railway metals were twisted, river embankments destroyed, bridges broken, whole towns of houses and temples reduced to ruins, and thousands of inhabitants killed. In the neighbourhood of Gifu the configuration of mountain and valley has been changed completely; and it is believed that a large tract of inland country has been depressed below the sea-level. An important centre in the pottery industry was involved in the destruction; while the floods and fires that ensued added to the havoc wrought. For a week following the great shock thousands of smaller disturbances continued to occur. In Tokyo and Yokohama the shock was fortunately not felt as an excessive one. The motion of the ground was much greater than is usually experienced; but it was of a gentle swaying character, and was consequently unaccompanied by any serious damage to property. It may be mentioned that the region most heavily visited is not volcanic, and is much less subject to shakings than regions farther east—another instance of the hopelessness of any attempt to predict the approach of a disastrous earthquake.

THE IVORY GATE.*

By WALTER BESANT.

CHAPTER I.—UP THE RIVER.

'CAN you not be content, George?' asked the girl, sitting in the stern. 'I think that I want nothing more than this. If we could only go on always, and always, and always, just like this.' She had taken off her right-hand glove, and she was dipping her fingers into the cool waters of the river as the boat slowly drifted down stream. 'Always like this,' she repeated softly. 'With you close to me—so that I could touch you if I wanted to—so that I could feel safe, you know—the sun behind us, warm and splendid, such a sweet and fragrant air about us, trees and gardens and fields and lanes on either side—and both of us always young, George, and—and nice to look at, and all the world before us.'

She, for one, was not only young and nice to look upon, but fair—very fair to look upon. Even young persons of her own sex, critics and specialists in the Art and Science of Beauty—rivals as well—had to confess that Elsie was rather pretty. I believe that few such critics ever go farther. She was, to begin with, of sufficient stature, in a time when dumpy women are not considered, and when height is a first necessity of comeliness: she paid, next, such obedience to the laws of figure as becomes the age of twenty, and is, with stature, rigorously demanded at this end of the century. Her chief points, perhaps, lay in her eyes, which were of a darker shade of blue than is common. They were soft, yet not languid; they were full of light; they were large, and yet they could be

quick. Her face was subject to sudden changes that made it like a spring-time sky of shower, rainbow, sunshine, and surprise. Her hair was of a very common brown, neither dark nor light. She was attired, this evening, in a simple gray frock of nun's cloth with a bunch of white roses on her left shoulder.

When one says that her companion was a young man, nearly all is said, because the young men of the present day are surprisingly alike. Thousands of young men can be found like George Austin: they are all excellent fellows, of much higher principles, on some subjects, than their fathers before them; not remarkably intellectual, to judge by their school record: yet with intelligence and application enough to get through their examinations moderately: for the most part they do pass them with moderate success: they are not ambitious of obtaining any of the great prizes—which, indeed, they know to be out of their reach—but they always set before themselves and keep always well in sight the ideal suburban villa and the wife: they always work steadily, if not feverishly, with the view of securing these two blessings; they always hope to secure an income that will enable them to maintain that wife—with a possible following of babies—in silk attire (for Sundays); in ease as to household allowance; and in such freedom of general expenditure as may enable her to stand up among her neighbours in church without a blush.

The world is quite full of such men: they form the rank and file, the legionaries: their opinion on the subject of labour is purely Scriptural—namely, that it is a curse: they do not particularly love any kind of work: they would prefer, if they had the choice, to do nothing at all: when they get their summer holiday they do nothing all day long, with zeal: they give no more thought to their work than is sufficient for the bread-winning: whether they are professional men or trading men their view of professional work is solely that it brings in the money. If such a young man becomes a clerk, he never tries to learn any more after he has left school: he accepts the position: a clerk and a servant he is, a clerk and a servant he will remain. If he is engaged in trade he gives just so much attention to his business as will keep his connection together: that and no more: others may soar: others may become Universal Providers: for his part he is contented with his shop and his Sunday feast. If he becomes a professional man he learns no more of his science than is wanted every day. The lawyer passes his exam. and puts away his law-books; he knows enough for professional purposes: the doctor reads no more; he knows enough for the ordinary needs of the G. P.: the schoolmaster lays aside his books; scholarship and science interest him no longer; he has learned enough to teach his boys: the curate makes no farther research into the history and foundations of his church; he has learned enough. In a word, the average young man is without ambition; he is inclined to be lazy; he loves the present far more than the future—indeed, all his elders unite in letting him know that his own is quite the most enviable time of life; he likes to enjoy whatever he can afford, so that he very often ents up all his

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wages : he does not read too much : he does not think too much : he does not vex his soul too much with the problems of life—greater problems or lesser problems—he accepts the teaching of his newspaper, and agrees with the words and the wisdom of yesterday's leading article : he accepts religion, politics, morals, social systems, constitutions, things present, past, and future, as if—which is perfectly true—he had nothing to do with them, and could not help it whatever was to happen. He never wants to alter anything : he believes that all British institutions are built on the solid rock and fashioned out of the hardest granite : any exceptions to this rule, he thinks, have come straight down from Heaven.

Observe, if you please, that this kind of young man confers the greatest possible benefits upon the country. He ought to be made a Baronet at least, if honours meant anything. His apparent sluggishness keeps us from the constant changes which trouble some nations : his apparent lack of ambition makes it easy for the restless spirits to rise : were the country full of aspiring young men we should be for ever having civil wars, revolutions, social upsandowns, new experiments, new religions, new governments, new divisions of property, every year. Again, it is this young man who by his steady attention to business, his readiness to work as much as is wanted, but no more ; his disregard of theories and speculations, his tenacity ; his honesty, his loyalty, his courage, and his stout heart, has built up the British name so that there has never been any name like unto it, nor ever will be again, for these solid and substantial virtues.

Being, then, just a young man of the time, George Austin was naturally like most young men in dress, in appearance, in language, and in manners. And had it not been for the strange experience which he was to undergo, he would have remained to this day just like other young men. He was better looking than most, having a good figure, a well-shaped head, and regular features, with eyes rather fuller of possibilities than falls to the lot of most young men. In short, a good-looking fellow, showing a capability for something or other in his firm mouth, ample cheek, strong chin, and resolute carriage. He would have made a fine soldier ; but perhaps an unsuccessful general, for want of that quality which in poets is called genius. In the same way he would in a lower walk keep a business together, but would fail to achieve a great fortune for lack of the same quality. As for his age, he was seven-and-twenty.

'Always like this,' the girl went on. 'Always floating down the stream under a summer sky. Always sweet looks and love and youth. It seems as if we could never be unhappy, never be worried, never want anything, on such an evening as this.' She turned and looked up the stream, on which lay the glory of the sinking sun—she sighed. 'It is good to come out on such an evening only to have a brief dream of what might be. When will the world give up their foolish quarrels, and join together to make the lives of all happy ?'

They had been talking, among other things, of socialism, all out of yesterday's leading article.

'When,' George replied, 'there is enough of good things to go round : when we invent a way to make all men ready to do their share as well as to devour it : when we find out how to make everybody contented with his share.'

Elsie shook her head, which was filled with vague ideas—the ideas of a restless and a doubting time. Then she went back to her original proposition. 'Always like this, George—and never to get tired of it. Time to stand still—nothing to change : never to get tired of it : never to want anything else. That is Heaven, I suppose.'

'We are on earth, Elsie,' said her lover. 'And on earth everything changes. If we were to go on drifting down the stream, we should get into trouble over the weir. To capsize would be a pretty interruption to your Heaven, wouldn't it ? And the sun will soon be setting and the river will get misty ; and the banks will grow ugly. But the chief thing is that we shall both grow old. And there is such a lot that we have got to do before we grow old.'

'Everything has to be done,' said Elsie. 'I suppose we have done nothing yet.'

'We have got to get married for the first thing, before we grow old.'

'Couldn't you love an old woman, George ?'

'Not so well, Elsie,' her lover replied, truthfully. 'At least, I think not.—And oh ! Elsie, whenever I do think of the future, my heart goes down into my boots. For the prospect grows darker and darker.'

Elsie sighed. She knew, already, too well, what was in his mind. Plenty of girls, in these days, know the familiar tale.

'Darker every day,' he repeated. 'They keep on crowding into the profession by multitudes, as if there was room for any number. They don't understand that what with the decay of the landed interest and of the country towns, and the cutting down of the costs, and the work that goes to accountants, there isn't half the business to do that there was. There don't seem any partnerships to be had for love or money, because the few people who have got a good thing have got no more than enough for themselves. It is no use for the young fellows to start by themselves ; so they have got to take whatever they can get, and they are glad to get even a hundred a year to begin with—and I am seven-and-twenty, Elsie, and I'm drawing two hundred pounds a year.'

'Patience, George ; something will turn up. You will find a partnership somewhere.'

'My child, you might as well tell Robinson Crusoe that a boiled leg of mutton with caper sauce is going to turn up on his desert island. We must not hope for the impossible. I ought to be grateful, I suppose, considering what other men are doing. I am planted in a good solid House. It won't run away, so long as the old man lives.'

'And after that ?'

'Well, Mr Dering is seventy-five. But he will not die yet, not for a long time to come. He is made of granite : he is never ill : he never takes a holiday : he works harder than any of his people ; and he keeps longer hours. To be sure, if he were to die without taking a partner—well

—in that case, there would be an end of everything, I suppose.—Elsie, here's the position.' She knew it already, too well—but it pleased them both to parade the facts as if they were something quite novel. 'Let us face it'—they were always facing it. 'I am Managing Clerk to Dering & Son—I get two hundred pounds a year—I have no prospect of anything better. I am bound all my life to be a servant. Elsie, it is not a brilliant prospect: I found out at school that it was best not to be too ambitious. But—a servant all my life—I confess that did not enter into my head. If I knew any other trade, I would cut the whole business. If there was any mortal thing in the whole world by which I could keep myself, I would try it. But there's nothing. I have but one trade. I can't write novels, or leading articles; I can't play on any instrument; I can't paint or act or sing or anything—I am only a solicitor—that's all. Only a solicitor who can't get on—a clerk, Elsie. No wonder her ladyship turns up her nose—a clerk.' He leaned his chin upon his hands and laughed the conventional laugh of the young man down on his luck.

'Poor George!' she sighed. In such a case there are only two words of consolation. One may say 'Poor George!' or one may say 'Patience!' There is nothing else to say. Elsie first tried one method and then the other, as a doctor tries first one remedy and then another when Nature sulks and refuses to get well.

'And,' he went on, piling up the misery, 'I am in love with the sweetest girl in the whole world—and she is in love with me!'

'Poor George!' she repeated with a smile. 'That is indeed a dreadful misfortune.'

'I am wasting your youth, Elsie, as well as my own.'

'If it is wasted for your sake, George, it is well spent. Some day, perhaps'—

'No—no—not some day—immediately—at once.' The young man changed colour and his eyes sparkled. It was not the first time that he had advanced this revolutionary proposal. 'Let prudence go to the'—

'Not there, George—oh! not there. To the winds, perhaps, or to that famous city of Palestine. But not there. Why, we might never get her back again—poor Prudence! And we shall be sure to want her all our lives—very badly. We will, if you please, ask her to go for a short voyage for the benefit of her health. We will give her six months' leave of absence: but we shall want her services again after her holiday—if you think we can do without her for so long.'

'For a whole twelvemonth, Elsie. Let us brave everything, get married at once, live in a garret, and have a splendid time—for a whole twelvemonth—on my two hundred pounds.'

'And am I to give up my painting?'

'Well, dear, you know you have not yet had a commission from anybody.'

'How can you say so, George? I have painted you—and my sister—and my mother—and your sisters. I am sure that no studio even of an R.A. could make a braver show of work. Well—I will give it up—until Prudence returns. Is it to be a garret? A real garret, with sloping walls, where you can only stand upright in the middle?'

'We call it a garret. It will take the form, I suppose, of a tiny house in a cheap quarter. It will have six rooms, a garden in front and a garden behind. The rent will be thirty pounds. For a whole twelvemonth it will be a real slice of Eden, Elsie, and you shall be Eve.'

Elsie laughed. 'It will be great fun. We will make the Eden last longer than a twelvemonth. I daresay I shall like it. Of course I shall have to do everything for myself. To clean the doorstep will be equivalent to taking exercise in the fresh air: to sweep the floors will be a kind of afternoon dance or a game of lawn-tennis: to wash up the cups and saucers will be only a change of amusement.—There is one thing, George—one thing—she became very serious—'I suppose you never—did you ever witness the scouring of a frying-pan? I don't think I could do that. And did you ever see beefsteaks before they are cooked? They suggest the animal in the most terrible way. I don't really think I could handle those bleeding lumps.'

'You shan't touch a frying-pan, and we will have nothing roasted or fried. We will live on cold Australian beef eaten out of its native tin: the potatoes shall be boiled in their skins. And perhaps—I don't know—with two hundred pounds a year we could afford a servant—a very little one—just a girl warranted not to eat too much.'

'What shall we do when our clothes are worn out?'

'The little maid will make some more for you, I suppose. We certainly shall not be able to buy new things—not nice things, that is—and you must have nice things, mustn't you?'

'I do like things to be nice,' she replied, smoothing her dainty skirts with her dainty hand. 'George, where shall we find this house—formerly Eve's own country villa before she—resigned her tenancy, you know?'

'There are places in London where whole streets are filled with families living on a hundred and fifty pounds a year. Checkley—the chief's private clerk—lives in such a place: he told me so himself. He says there is nobody in his parish who has got a bigger income than himself: he's a little king among them because he gets four hundred pounds a year, besides what he has saved—which is enormous piles. Elsie, my dear, we must give up our present surroundings, and take up with gentility in its cheapest form.'

'Can we not go on living among our own friends?'

George shook his head wisely. 'Impossible. Friendship means equality of income. You can't live with people unless you do as they do. People of the same means naturally live together. Next door to Lady Dering is another rich Madam, not a clerk's wife. For my own part I shall sell my dress clothes for what they will fetch—you can exchange your evening things for morning things. That won't matter much. Who cares where we live, or how we live, so that we live together? What do you say, Elsie dear?'

'The garret I don't mind—nor the doorsteps—and since you see your way out of the difficulty of the frying-pan'—

'You will be of age next week, when you can please yourself.'

'Hilda gives me no peace or rest. She says that there can be no happiness without money. She has persuaded my mother that I am going to certain starvation. She promises the most splendid establishment if I will only be guided by her.'

'And marry a man fifty years older than yourself with one foot already well in'—

'She says she has always been perfectly happy. —Well, George, you know all that. Next Wednesday, which is my birthday, I am to have a grand talk with my guardian. My mother hopes that he will bring me to my senses. Hilda says that she trusts entirely to Mr Dering's good sense. I shall arm myself with all my obstinacy. Perhaps, George—who knows?—I may persuade him to advance your salary.'

'No, Elsie. Not even you would persuade Mr Dering to give a managing clerk more than two hundred pounds a year. But arm yourself with all you have got—don't forget any piece of that armour, child. The breastplate—there was a poor damsel once who forgot that and was caught by an appeal to her heart—nor the helmet—another poor damsel was once caught by an appeal to her reason after forgetting the helmet. The shield, of course, you will not forget—and for weapons, my dear, take your sweet eyes and your lovely face and your winning voice—and I swear that you will subdue even Mr Dering himself—that hardened old parchment.'

This was the kind of talk which these lovers held together whenever they met. George was poor—the son of a clergyman, whose power of advancing him ceased when he had paid the fees for admission. He was only a clerk, and he saw no chance of being anything else but a clerk. Elsie could bring nothing to the family nest, unless her mother made her an allowance. Of this there could be no hope. The engagement was considered deplorable: marriage, under the circumstances, simple madness. And Hilda had done so well for herself, and could do so much for a sister so pretty, so bright as Elsie! Oh! she was throwing away all her chances. Did one ever hear of anything so lamentable? No regard for the family: no ambition: no sense of what a girl owes to herself: no recognition or gratitude for the gift of good looks—as if beauty was given for the mere purpose of pleasing a penniless lover! And to go and throw herself away upon a twopenny lawyer's clerk!

'George,' she said seriously, 'I have thought it all out. If you really mean it—if you really can face poverty—mind—it is harder—much—for a man than for a woman'—

'I can face everything—with you, Elsie,' replied the lover. Would he have been a lover worth having if he had not made that answer? And, indeed, he meant it, as every lover should.

'Then—George—what in the whole world is there for me unless I can make my dear boy happy? I will marry you as soon as you please, rich or poor, for better for worse—whatever they may say at home.—Will that do for you, George?'

Since man is so constituted that his happiness wholly depends upon the devotion of a woman,

I believe that no dear boy ever had a better chance of happiness than George Austin—only a managing clerk—with his Elsie. And so this history begins where many end, with an engagement.

THE MONUMENT.

To the Londoner there is only one monument in the world—The Monument. And now that an agitation has been set on foot for its demolition or removal to the Victoria Embankment, we may be sure that a good deal of feeling will be exhibited on the part of the public who are partial to the ancient glories and landmarks of the City. The Monument, as is well known, was erected to commemorate the extinction of the Great Fire of London; and while its erection was not untinged by partisanship, it still remains a very interesting memorial of a state of public feeling that, we hope, is now less and less manifested.

The summer of 1666 had been excessively dry, and the wood and plaster houses of old London were consequently in a ripe condition for burning, when the fire which proved so disastrous broke out. Every effort was made to prevent the spread of the flames, and everybody lent what aid he could in rescuing life and property. Even the king seemed to think seriously of the matter, and indeed a contemporary writer informs us that he took great pains—'no less than if he had been a poor labourer'—and 'stretch forth his own royal hands to assist in the putting out of those aspiring flames, which seemed to expect a princely extinguisher.'

There is no need to dwell upon the extent of the ravages of this dreadful conflagration, for that is well known to all; it will be sufficient to say that the City rose from its ashes, an improvement perhaps upon the old one, but not by any means so great a one as might have been made, had Wren's plans for rebuilding it been accepted and carried out.

In order to 'preserve the memory of this dreadful visitation,' an Act of Parliament was passed enacting that a column or pillar of brass or stone should be erected on or near unto the spot where the fire broke out, in perpetual remembrance thereof, and that such inscriptions as the Mayor and Court of Aldermen might direct should be engraved thereon. Sir Christopher Wren was appointed to design and carry out the erection of the column. For this purpose he drew up several designs, notably one with sculptured flames of gilt bronze issuing from the loopholes lighting the staircase; and a phoenix, also of gilt bronze, upon the summit. It was found, however, that this design would prove too costly; and, moreover, the resistance which the outspread wings of such an ornament would offer to the wind would have rendered it somewhat unsafe. The great architect then suggested a statue of Charles II., twelve or fifteen feet high, which in brass would have cost one thousand pounds. Such a finishing would, he thought, be more valuable in the eyes of foreigners and strangers, and worthy of the greatness of the pillar. This was submitted to His Majesty, who, although he did not dislike the idea of a statue, was of opinion that a large ball of metal would

be more ornamental at a distance. Next to a statue, this seemed the most suitable thing that could be placed upon the column, 'by reason of the good appearance at distance, and because one may go up into it and upon occasion use it for fireworks.'

The work of erecting the Monument was accordingly commenced in 1671, the site chosen being that upon which the church of St Margaret, New Fish Street, had stood before the fire, and was exactly two hundred and two feet—the height of the column—from the spot where the fire broke out.

The Rev. Samuel Rolle, whose meditations upon the fire and its results are well known, found food for reflection not only in the site selected for the Monument, but also in the materials of which it was proposed to construct it. Nothing, he thought, is more emblematical of fire than burnished brass; and moreover, if the City, as it was alleged, met its destruction by 'the treachery of the Papists,' no metal could be more appropriate as showing that they had sinned with a brow of brass. If, on the other hand, stone were used, that would be a lasting emblem of the hardness of their hearts in burning such a city and bringing thousands of families to ruin. It was his opinion that a memorial should have been placed where the fire ended, to mark the termination of the citizens' sufferings, rather than where it now stands. In this opinion he had the support of Evelyn, who would like to have seen in addition 'a plain lugubrious marble' placed where it broke out.

As is generally known, the substance chosen was stone; and the column was completed in 1677, the work having proceeded somewhat slowly on account of the difficulty of obtaining stone of sufficient size and quantity. To remedy this, a proclamation was issued forbidding the transport of stone from the Isle of Portland 'without leave and warrant first obtained from Dr Christopher Wren, surveyor of our works.' Altogether, 28,196 cubic feet were used in the construction of the Monument, which is a fluted Doric column, 202 feet high; the body of the shaft is fifteen feet in diameter, and stands upon a pedestal forty feet high and twenty-one square. Upon the summit is a blazing urn of gilt brass, supported by a cone thirty-two feet high, around which is an iron balcony. Upon the north side of the pedestal is graven a lengthy legend in Latin, which describes the extent of the damage done by the fire, and formerly ended in this manner: 'But the Papistical malice which perpetrated such mischiefs is not yet restrained.' This last line formed no part of the original inscription, but was added, by order of the Court of Aldermen, in 1681, at which time rumours of the Popish Plot were disturbing men's peace of mind, and exciting in them horror and hatred of the Papists in an extreme degree. In 1685, however, this line was erased, only to be cut still deeper four years later. Once more, and for ever, it was obliterated in January 1831 by Act of Common Council. In the same manner was treated the following inscription, which was engraved around the base of the pillar, beginning on the western side: 'This Pillar was set up in perpetual remembrance of that most dreadful burning of this Protestant City, begun and carried on by the

treachery and malice of the Popish faction in the beginning of Septem. in the year of our Lord 1666, in order to the carrying on their horrid plott for extirpating the Protestant religion and old English liberty, and the introducing Popery and slavery.'

It was the recutting of these offensive inscriptions that inspired Pope with the well-known lines:

Where London's column pointing at the skies,
Like a tall bully lifts the head and lies.

Upon the south face is another legend, also in Latin, and somewhat lengthy, which informs us of the measures which were taken for the restoration of the City in the best possible manner, such as widening and levelling streets, rebuilding churches, bridges, and gates. The east side records the names of the Lord Mayors in whose years of office the column was begun, continued, and completed.

A most interesting feature of the Monument is the allegorical picture upon the front or west side. It was sculptured by Gabriel Cibber, father of the famous actor and poet-laureate, and represents the City—in the form of a female figure—wearing a most unhappy look. Time is trying to raise her, while Providence bids her look towards a cloud upon which are seated figures of Peace and Plenty. To the right is a figure of the king, who wears a laurel wreath upon his head, and holds a truncheon in his hand. He is attended by Science, Architecture, and Liberty, whom he bids render assistance to the languishing City. Behind the king stands his brother, the Duke of York, who holds a garland in one hand wherewith to crown the City, and in the other a sword for her protection. Justice and Fortitude bring up the rear; while beneath the raised pavement upon which the king is seen, grovels Envy, gnawing at a heart. This figure gave rise to an amusing query some time back, a correspondent of *Notes and Queries* asking the editor of that paper whether it was intended to represent a man swallowing an oyster!

Although Cibber was a sculptor of great capability, as shown by his well-known figures of 'Raving and Melancholy Madness,' which were formerly over the gates of Bethlehem Hospital, and are now in the Guildhall Museum, this specimen of his work has been severely criticised. Wren's biographer considered it sufficiently rude and gross. 'Charles,' he continues, 'is bewigged and be-Romanised; scaffold poles support Portland stone clouds, and solid genii float bisected with joints of mortar as thick as their fingers. The scaffolding, ladders, and hodmen have been admired for years, and record the dresses of the labourers with more fidelity than that of the monarch and his architect.'

The total cost of erecting the Monument was £13,700, of which Cibber was paid £600 'for carving the hieroglyphick figures'; Robert Bird, coppersmith, £128, 6s. for the copper urn; and William French, £104 for setting up the balcony. The remainder mostly went in masons' and carpenters' charges, &c.

In the present day, when there is everywhere a craze for building Babels, the 'Metropolitan Maypole,' as the Monument has been called, is

no longer to be marvelled at on account of its proportions. At the time of erection, however, it was spoken of as 'the biggest and highest all Europe has to show,' being considerably taller than the columns of Trajan and Antoninus. But if our pillar does not impress the visitor of to-day with the magnificence of its proportions, it may at least claim his attention on the score of the historic interest with which it is imbued. It is for this reason, perhaps, that the greater number of sightseers in London betake themselves to Fish Street Hill; although not a few find the journey up the winding stairs—three hundred and more in number—and the admission fee of threepence repaid by the view which is sometimes to be obtained from the summit. Addison on one occasion visited the Monument in company with his friend the fox-hunter, and found the 'perpendicular march' very trying both to wind and limbs, having to pause for breath several times on his way up. His friend, on the contrary, being a 'well-breathed man,' quickly mounted the steps; and by the time poor Addison emerged from the darkness of the staircase, had counted all the steeples and churches that were within sight, and was calculating upon how many acres they stood. The number of warehouses and barns visible from this elevated position raised in his mind thoughts of Popish meeting-houses which required all Addison's persuasive powers to dispel. On reaching the street again, the fox-hunter was more than joyed at reading the inscription which accused the Papists of burning London, as he had always been under the impression that the Presbyterians were responsible for the act. This impression was the result of a country attorney's information, who doubtless held opinions savouring of Papacy.

The Royal Society at first made use of the Monument for astronomical observations; but the vibration of the column, due in some measure to the constant stream of traffic in the vicinity, so affected the nicety of their experiments that they had to be discontinued. Owing to this, a report quickly spread that the column was unsafe, and for some time people were afraid to ascend. As, however, there was no collapse, they gradually got the better of their fear, and continued their visits. It was formerly permitted to continue the upward journey beyond the cage in which visitors now stop; and Roger North gives the following interesting account of a visit at a time when the interior of the flaming urn was open to the public. He says: 'We mounted to the top, and one after another crept up the hollow iron frame that carries the copper head and flames above. We went out at a rising plate of iron that hinged, and there found convenient irons to hold by. We made use of them, and raised our bodies entirely above the flames, having only our legs, to the knees, within; and there we stood till we were satisfied with the prospects from thence. I cannot describe how hard it was to persuade ourselves we stood safe, so likely did our weight seem to throw down the whole fabric.' Those who have paid a visit to the top of the Eiffel Tower will doubtless remember experiencing a similar feeling on a larger scale to that described by Roger North.

The 'London Spy' could not, of course, omit seeing the Monument in his travels, and was

informed by his guide that it was the first thing that caused wry-necks in England, by reason of the people 'staring at the top on't.' As for the utility of it, the vintners' boys and drawers visited it once a week for the purpose of exercising their legs and learning the 'tavern-trip' by running up to the balcony and down again. An instance is on record of a drawer at the *Baptist's Head Tavern* in the Old Bailey performing this feat for a wager which was laid by some of the frequenters of that house. The boy was allowed three minutes, but was down again in two and a half, a performance which gained him the applause of the bystanders, if he did not manage to get the wager paid.

The Monument seems to have had the same fascination for suicides as some other lofty structures, notably Clifton Suspension Bridge. No fewer than seven persons have met their deaths from this pillar, six of which were suicides. Cradock, a baker, was the first to throw himself over in 1788. Next on the list is Lyon Levi, the diamond merchant, who was in the thoughts of the 'vulgar little boy' when he was contemplating self-destruction from Margate pier:

And now I'm here, from this here pier
It is my fixed intent
To jump as Mr Levi did
From off the Monument.

A baker named Leander; Margaret Moyes, a baker's daughter; a boy named Hawes; and Jane Cooper, a servant girl, were the other unfortunate victims of suicidal mania, the seventh death being that of a man who fell from the balcony accidentally while looking at a live eagle that was kept in a cage there. Advantage was taken of these melancholy occurrences to publish 'special' news-sheets containing detailed accounts of them, with a grotesque illustration, and perhaps a few verses on the subject with a moral of some sort running through them.

SUNSTRUCK.*

CHAPTER X.

'No, my boys; I am going to say no more about it. I believe you, John Manton, fully. I grant that the declaration was an accident, and that you would have spoken to me. It has been a surprise, for I could not help suspecting Josee of liking you, and I thought it was mutual.'

'On my honour as a man, Captain Greville,' cried Manton, 'never since I have been your guest have I said word, or given your adopted child look when we have been alone that you might not have heard or seen.'

'I believe you, John Manton; and sorrowfully enough I congratulate you, for you are a fortunate fellow.—Now, let's finish our wine and change the subject. There has been enough of this for one day. Another time we'll discuss the matter in its business light.—But come, Burns; you look very solemn. Is there another complication? Do you want to make a clean breast about anything?'

'Yes, sir,' cried the young officer, flushing like a school-girl; 'but I can't find words to say what I wish.'

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'Shall I say the words for you?—This has all been a complete piece of deceit: you and John Manton here knew I had two pretty daughters, and you determined to come and carry them off.'

'Don't treat it like that, sir,' cried Burns; 'it is too serious. I am weak yet, and I can't speak as I should like; but I will tell you—I do love Miss Maine—Josephine.'

'And you want my consent?'

'Yes, sir,' said Burns sadly; 'but I want hers too, and it seems hopeless.'

'Faint heart never won fair lady,' said the captain, shaking the young man's hand. 'Be patient and wait.'

He opened the door and drew aside the curtain for the young men to pass into the drawing-room, where Renée and Josephine were sitting far apart.

That evening passed like a dream to John Manton, in spite of several fierce or mocking glances from Josephine's eyes. But he paid little heed to them, for he saw that she was laughing merrily and chatting with Burns half the time, while the latter was giddy with excitement and delight.

After a time, at his earnest request, she sang ballad after ballad, Renée willingly playing the accompaniments, and Josee's sweet rich contralto voice never sounded more full of power and passion. The notes thrilled through Burns, and in his fool's paradise he made himself believe that the loving expression given to the songs was intended for his ears and his alone.

But when all separated for the night, he was somewhat chilled by Josee's manner. He spoke to her tenderly, but he could not conceal from himself that the words she uttered in return had a half-mocking ring. Still, he brightened up when he reached his room, where Manton stayed with him for a few minutes, looking dreamily happy and content, for the gentle pressure of Renée's hand still clung to his fingers, and in her eyes he had read a young innocent girl's first love and devotion to the man of her heart.

'Ah, Jack!' said Burns with a sigh, 'I wish I were as happy as you seem to be.'

'There is no seem, old fellow, for it is all true—true as heaven. Only wait, and you will be the same. There; good-night. I'm too stupid to talk. It is all so new and strange—so much greater than I can believe.—Good-night, lad—God bless you!'

He hurried out of the room, through the mat-draped doorway, to his own.

Burns tossed off the white coat he wore, lit a cigar, and went to the open window to lean out over the long, low, flower-hung veranda, and drink the delicious, comparatively cool night-air. It was profoundly dark; and he listened to the peculiar notes of the night-birds in the neighbouring forest, and the whir and chirp of the abundant insects that thronged around. He was thinking of Josephine, and going through the evening once again, when it struck him that he could hear a faint whispering somewhere close at hand, like the voices of two people in eager consultation, the one deep and angry, the other almost piteous, and broken every now and then by a sob.

This roused his curiosity, and he was wondering who it could be, when the whispering sud-

denly ceased, and from a distance rose a dull, low, thrumming, followed by a chorus of voices, sounding weird and strange in the darkness, with the lightning playing faintly just above the spot whence the music seemed to come.

'How fond these blacks are of night meetings,' thought Burns. 'Well, they work hard enough by day, and they have a right to some amusement, of course.—I wonder whether she ever will—I wonder whether she ever will—Bah! what a coward I am.'

He left the window and went to the draped doorway which separated the rooms, drew the matting aside and whispered: 'Asleep, Jack?'

A heavy breathing came back for answer, and Burns dropped the hangings.

'Asleep and happy, poor fellow. Well, Heaven bless 'em both! I wonder whether I can get my share.'

He threw off his clothes and lay down; but his mind was not at rest, and hour after hour passed with the sleep he wooed refusing to come.

At last a peculiar drowsy sensation assailed him, and he was just dropping off, when he started back into wakefulness to lie listening to a rustling movement in the next room, followed by a faint *chink* as of glass against glass, and then came a trickling sound.

'Jack's thirsty,' he said to himself. 'So am I. Shall I get out and have a good drink? Yes, I will—no, I will not; the water will be flat, mawkish, and warm. I wish I had an orange—I wish—I wish'—

It must have been something about Josee, and her hands giving him some luscious production of the captain's garden, for a smile played about his lips as he forgot his thirst, and dropped off soundly into a deep sleep, which lasted till the cathedral birds were chanting loudly in the dewy woods. Then he awoke with a start, for the idea was strong upon him that he had heard the sound of a fall, and a deep groan in his room, and that he had been grasped by a hand, while a voice whispered sharply: 'Will—Will—for God's sake—help!'

CHAPTER XI.

All was perfectly still for a few moments; and in the belief that he had been dreaming, Burns was about to settle himself down to sleep again, when a groan came from the adjoining room; and hurrying in, it was to find Manton writhing on the floor, his face all drawn and ghastly in hue, his brow covered with great agony-wrung drops, and his teeth set upon one of his arms to check the cries which strove to escape.

'Jack, what is the matter?' cried Burns, hurrying to his friend's side.

Manton raised his head a little and gasped forth in a choked unnatural voice: 'Water—burning—help!'

There was a great porous vessel on the table, and a glass by its side, which Burns filled hastily and bore to his companion, who dashed out his hand to seize the glass, but only struck it from Burns's grasp, for it to fall on the matting, every drop being spilled.

Before he could fill it again, Manton writhing in a fresh paroxysm the while, there was a sharp tap at the outer door, and Greville's voice was heard.

'May I come in?' he said. 'Is anything the matter?'

Burns flew to the door and flung it open.

'For goodness' sake, get some brandy, sir. The poor fellow is in a horrible state.'

Greville hurried to Manton's side, dropped on one knee, hurriedly asked him a few questions, and examined him the while.

'What is it, sir?' whispered Burns; 'the fruit?'

'Fruit? No,' said Greville, through his teeth. '—Here, Manton, my lad, try and speak. What have you taken?'

No words came, but the young man feebly pointed to the water-vessel.

Greville caught up the glass from the floor, poured into it a portion of the contents of the vessel, tasted it cautiously, and then spat it violently out and poured the contents of the glass back again.

'Don't touch any more of that, any one,' he cried. '—Stop; I'll secure it;' and catching up the vessel, he hurried with it out of the room, to return at the end of a few minutes with another glass, whose contents he forced the young man to swallow. It was a hard task, though, for his teeth were set fast, and he was writhing and groaning in the midst of agony which was insupportable.

By this time the whole house was astir. Renée and Josephine had hurriedly dressed, and the former had been twice to the bedroom door to beg for news, but only to be summarily dismissed, and return to her companion, whose face was drawn into a set frown, her eyes looking wild and strange, and in her way she seemed to be suffering as deeply as Renée.

'What does papa say?—what does he say?' she whispered hoarsely. 'Is it the old illness come back?'

'I don't know. He will not speak. I was to go back and wait,' sobbed Renée. 'Josee, dear, do you think he is very bad?'

The girl made no answer, but began to pace the room hurriedly, looking wild and strange. Several times over, she shuddered and made for the open window, as if to hurry out into the garden; but she always checked herself, and resumed the hurried pacing of the room.

Twice over, a low moaning reached them, and Renée ran to the door, wringing her hands; while Josephine thrust her fingers into her ears to shut out the sound.

Then there was silence again, and they waited, till all at once, so wild a cry of agony rang out that Renée could bear no more, and, rushing up-stairs, passed at once into the sufferer's room.

Her father started from where he had been bending down over Manton, trying to restrain him, and turned to her.

'Renée, my child,' he whispered, 'how could you be so mad as to come here. I am doing everything I can for him.'

'Yes, yes,' she said in a pitiful tone; 'I know, I know; but you can't do this;' and, sinking upon her knees by the pillow, she laid one of her soft white hands upon the young officer's brow, as she whispered: 'Jack—Jack—my darling—if I could but bear it for you!'

He turned his strained and bloodshot eyes to her, raised his hands and pressed them upon hers,

a low painful sob escaping from his lips before he set his teeth and lay with his eyes closed, evidently suffering acutely.

Renée looked up at her father—a long appealing look; but he shook his head.

'I can do no more,' he said. 'That is right: try and get him to suffer patiently. There may be a little hope.'

Renée's eyes dilated with horror.

'May be a little hope!' she said half aloud; and, uttering a stifled cry, she laid her brow upon the edge of the bed, her lips moving fast in prayer.

Greville stood gazing down at the young people for a few minutes, heart-wrung by his child's agony, and fully realising now the potency of the first love awakened in her breast. Then with a sigh of misery he walked across to the window, where Burns was standing, ready to look appealingly in his eyes.

Greville read his thoughts, and said in a whisper: 'I can do no more. It is horrible—horrible!'

'Yes; but tell me,' said Burns, 'what is the complaint? Have you given him medicine?'

'Don't you see what it is?'

'No: only that he seems in frightful, cramping, burning pain.'

Greville was silent for a few moments, and then gloomily: 'You must know the truth,' he said in a voice so low that his words were hardly audible: 'he has been poisoned.'

'What!' cried Burns excitedly.

'Hush! Come down with me to my den;' and, unnoticed by Manton and Renée, they stole from the chamber, and into the captain's private room, half-office, half-study, where, after closing the door, he unlocked a cupboard, took out the porous vessel that had stood upon Manton's table, and then taking a glass, he poured out a little, tasted it, and spat twice.

'Yes,' he said; 'that is the third time of testing it. I cannot be mistaken—it is manchineel.'

'Manchineel? What is manchineel?'

'The deadly poison used by the black people to get rid of their enemies.'

'Impossible!' cried Burns. 'Poor Jack had no enemies. The black people liked him, for he was generosity itself. No one could be so cruel. And without a motive! There was no'—

He stopped short, with his face blanching and a look of horror in his eyes.

'Well,' said Greville hoarsely, 'what are you thinking? You are suspecting some one.'

'I? No, no!' cried Burns. 'Whom could I suspect?'

The captain's face was very white too, as he caught Burns's arm in a fierce grip, and his voice sounded strange in the young man's ears. 'That drug is terrible in its effects. Please God, the antidote I have given may save John Manton's life; but if he dies, I have seen enough yesterday and this morning to know that it will destroy another young life as well. William Burns, you suspect some one; and if I can bring home the guilt to the wretch who has done this thing, even if it were one dear to me, he should suffer by the law—if I could withhold my own hand, and not be his executioner myself. Now! Speak out: the truth. Hah!'

It was as if a sudden revelation had flashed across his brain, and loosening his fierce grip of the young man's arm, he staggered back into a chair, and sat gazing wildly up at Burns.

'No, no!' he panted; 'it is too horrible. It is impossible.'

'Yes,' cried Burns; 'the thought is too horrible. It is impossible.'

'He thinks the same—he thinks the same,' muttered Greville; and he let his face drop down into his hands, as, in rapid review, he ran over the incidents of the love matters of the young people, of the pangs of jealousy and hatred, and of there being the strain of the vindictive black blood in certain veins. Then he thought of the people on his plantation, their secret meetings, their dabbings in witchcraft so called, and poison; and he recalled the different cases of death which had occurred in the island, several of which could be traced to poison.

'No, no!' he gasped, as he raised his head again, and saw Burns gazing at him with a look full of agony and despair. 'It is impossible. But you—you are thinking the same still.—You believe it—you suspect her.'

'No,' cried Burns fiercely. 'I do not suspect her. Do you think I could suspect the woman I love of such a horror!'

Greville stood with his brow deeply lined, gazing straight before him, and as he remained there fixed, the glass rattled against the porous vessel, for the floor vibrated with the hurried tread of some one walking to and fro in the next room, and once more the eyes of the two men met in a penetrating gaze.

'Not in a sane moment,' said Greville at last aloud, but as if speaking to himself; 'but perhaps in a mad fit of jealous passion.—Come with me.'

'No,' cried Burns fiercely, as he barred the way. 'Where are you going?'

'To see my patient,' said Greville, with a bitter smile.

Burns gave way, and followed his host into the chamber, where the situation remained the same. Manton was in agonising torture, but one arm was about René's neck.

He opened his eyes as they entered, and Greville crossed over to him and laid his hand upon his brow.

'Don't—don't let me die—now,' he whispered. Then his face contracted again, and Greville shrank away, signing to Burns to follow.

'It is too hard to bear,' he whispered. 'Poor lad!—poor lad!'

He led the way to his own room again, and now Burns caught his arm.

'A doctor,' he said—'a doctor.'

'There is not one upon the island,' replied Greville. 'If there were a hundred, they could do no more than has been done.'

He stopped, listening to the rapid pace to and fro in the dining-room, and, with his face contracting more and more, he whispered the one word 'Come!'

'No,' said Burns again fiercely. 'You shall not go there. It is a cruel insult. It is madness. I tell you it is impossible.'

'And yet in your heart you believe it,' said Greville sternly, 'or you would not try to stop me. Come.'

'You shall not go,' cried Burns.

'Silence, boy. I stand to her in the place of her father. Recollect, too, that you are as weak as a child. I will be just, but I must have this cleared up and at once.'

He grasped the young man's wrist in a tremendous grip, and Burns was constrained to accompany him as he led the way into the dining-room, where, with her long black hair dishevelled and her face wild with horror, Josephine was walking rapidly to and fro, caged in by the horrible thoughts from which she was trying vainly to escape.

CHAPTER XII.

The girl did not hear them enter, and walked on with her eyes fixed, like one walking in her sleep, till she was close upon Greville, when she started excitedly, caught at his arm, and thrust her face close to his.

'John Manton?' she said in a husky tone of voice. 'How is he? Is he better?'

'No,' said Greville, gazing down at her fiercely.

'What is the matter with him?' she cried imperiously.

'You know,' said Greville coldly.

'I? No! Oh no! I do not know,' she said rapidly; and she laid her hand upon her breast, as if to stay its throbbings.

'Then I will tell you,' said Greville in a slow, hard, magisterial tone.

'No, no,' cried Burns. 'Captain Greville, it is an outrage.—Josephine, go to your room. You shall not hear his words.'

She darted a grateful look at him; and then faced the captain, as he said sternly: 'Silence, boy! That poor fellow—my guest—the man to whom my child has given her heart—lies above us, foully—treacherously poisoned.'

'Ah!' cried Josephine, uttering a wild cry.

'No, no, no; it is impossible.'

'It is possible, for it has been done.'

'No, no,' cried Josephine wildly, as she threw herself upon her knees at the captain's feet. 'Don't say that. Father!—my more than father, don't say that.'

'I do say it; I will say it; and it has been done by the accursed hand of one who was wildly jealous of him—mad that he had fixed his affections elsewhere.—Josephine, I took you to my heart as a child; I have been as your father, and now you have stricken at me through him—through them.'

'What!' she cried, shrinking back so that she half crouched upon the floor, supporting herself by one hand.

'I say you have stricken at me through them.'

'No, no; it is not true,' she cried hysterically.

'No other hand could have done the cruel deed; no other could have had access to the room above and drugged the water with manchineel.'

'Manchineel?' cried Josephine, gazing wildly before her. 'Ah, yes; it must have been manchineel.'

'Your words almost convict you, girl. You have always loved to consort with the wretched women who practise upon their fellow-slaves. You know of the powers of these drugs.'

'I? No,' she cried hurriedly; 'very little.'
'Enough for the purpose. Answer me: you placed that poison where he would drink of it?'

'I?—No, father, no!—It is too cruel.'

'Yes, it is too cruel,' cried Burns.

'You deny it? Do you deny that you cared for Mr Manton, and suffered bitterly from jealousy at what you have seen?'

'No,' she cried, rising slowly, and shaking back her hair from her face; 'no; I do not deny that I did suffer, as I am suffering now.'

'Captain Greville, you hear. Have some mercy.'

'Yes, I will have mercy if she will confess.'

'That I poisoned John Manton!' said Josephine proudly. 'No; I cannot confess. I would sooner have poisoned myself and been at rest.'

'I'd give the rest of my poor life to know that this was true,' cried Greville.

'But you believe me guilty,' said the girl, drawing herself up. 'Well, I am little better than a black slave. I have lived upon your charity all these years; now send me back amongst your slaves; punish me, if you will. I could not be more wretched than I am. What will you do—flog me? Well, I have nothing to confess.'

'Josephine, my child!' cried Greville wildly, 'it was in a fit of madness.'

'Ah!' she cried, as his appealing tones rang through her, and she threw herself at his feet.

'Now then—the truth—the truth?'

She rose and shrank away. 'I have told you the truth,' she said coldly, 'and you do not believe. I would have died sooner than injure him and break poor Renée's heart.—And you,' she said, turning sharply upon Burns and speaking with a curiously *naïve* innocence of manner. 'I am not blind: you always liked me from the first. Do you, too, believe I could be the wretch he thinks?'

'No,' cried Burns excitedly, as he caught her hands and held them firmly. 'I do not believe it, dear; and I'll fight your battle against the whole world.—Now, Captain Greville, what have you to say?'

The captain turned upon him slowly as Josephine drooped over the hands which held hers, kissed them both, and then sank down weeping hysterically.

CURIOUS WEAPONS.

In these days, the appliances of war have been elaborated to such a degree that it is questionable whether they are not rather too scientific to be used by excited men in so rough a business as actual fighting. But on this subject invention has never stood still, and there is hardly any race so barbarous or low in the scale as not to have some ingenious 'slaughter-weapon' to show.

Perhaps a too practical acquaintance with the claws of wild beasts led some races to copy their use. The best-known instance of this is the Indian 'bāgh'nakh,' or tiger's claw, consisting of from three to five steel claws about two inches long, connected together, and furnished with rings in which to insert the fingers. This horrid con-

trivance was carried in the left hand, leaving the right free for a dagger; and the identical 'tiger-claw' wherewith Sivaji, founder of the Mahratta kingdom, murdered the Mogul's general, is now in the Indian Museum. But in actual war the bāgh'nakh would have been only an encumbrance, and its use was confined to private feud. Some of the White Nile tribes use an iron ring on the right wrist, with diverging blades four or five inches long. The Samoans, without the feline race to copy, invented the 'fighting glove,' a sort of mat of coco fibre, tied to the hand by strings, and thickly set with rows of sharks' teeth.

The boomerang (literally, 'kangaroo-stick') is too well known to need description; but it may be said that there are two varieties, one of which, the war boomerang, was not intended to return to the thrower. It is much less curved and heavier than the other or 'circling' weapon. Boomerangs of this sort were in common use in Southern India, made of wood, iron, and even ivory; but the returning boomerang is solely Australian. The best performers were the blacks of the Riverina plains, and marvellous some of their feats were; but few of them are left, and before long, boomerang-throwing will be a lost art.

The 'chakra,' or quoit, of India is a very ancient weapon. It was much affected by the 'akalis,' or champions, of the Sikhs, and is still in use in the Punjab. The akali wore a conical cap some two feet high, formed of plaited cane, covered with blue cotton cloth, surrounding which, hoop-fashion, were sometimes as many as nine quoits, from a foot to four inches diameter, of light thin steel, and sharpened outwardly to a knife-edge. When the warrior desired to use them, he passed his forefinger through the uppermost to lift it off, gave it a rapid spin on the finger overhead, and launched it horizontally at his enemy's face. Some of these men were said to have made good practice at eighty yards. But its use was resorted to only when hard pressed, as the quoits were often valuable articles, inlaid with gold, and the chances of recovery after a *mélée* would be small.

Another odd missile weapon is the Central African 'trombash.' This is a species of knife, but of the most eccentric shape, no two specimens being alike, and resembling old English capital letters in outline. They are formidable weapons when used by practised hands; but it is quite evident in examining them that a good deal of labour has been wasted on them, for many of the blades and projections are so placed as to be perfectly useless. Africans in general seem to have a weakness for unnecessary detail in their weapons. Some of them spend a vast amount of labour and skill in forging the most atrocious-looking arrow and spear heads, bristling with barbs till they look like awns of barley imitated in iron. Some of them go so far as to make the barbs point in opposite directions, so that the arrow may neither be drawn out nor pushed through. It is strange that no African race seems to have any idea of making a really effective sword or dagger. All those illustrated in books of travel or exhibited in collections are curiously unpractical instruments. The same peculiarity

can be seen in the curious axes used by the Khonds and other aboriginals of Central India, the blades of which are scolloped and crescented in a way to take away greatly from their efficiency.

The national Malay weapon, the kris, is said to have been invented by a Javanese monarch of the fourteenth century. Its varieties are said to exceed a hundred, and there are in Javanese no fewer than fifty names for them. It varies in size, from the two-foot wavy blade of Sulu down to a mere toothpick. But the peculiarity is that the weapon is never ground, but kept rough and saw-like in edge, by scouring with lime juice or the juice of an unripe pine apple, sometimes mixed with arsenic; and it is on this account that kris wounds are so dangerous. Old specimens are so eaten away by this practice that the blade seems formed from a bunch of wires roughly welded up. Such krises are highly valued, and some of the ancient ones, heirlooms of chiefs, with grotesquely carved and inlaid hilts and sheaths, are almost unobtainable.

The Bornean 'mandau,' or 'head-taker,' is a modification of the Burmese 'dah.' It is a heavy thick-bladed cutlass, from twenty to thirty inches long, and the edge is ground from the right side only, the left side being forged slightly concave. The blade is also slightly curved to the right, so that the cutting action of the weapon is like that of an enormous gouge. Only two strokes can be dealt with the mandau—from right to left downwards, and left to right upwards.

But it is to India that we must look for strange and ingenious varieties of the sword and dagger, as well as for the most striking examples of art in arms. The weapon common to every part of Hindustan, so as to deserve the name of the national arm, is the 'katar.' This is a broad two-edged dagger, the hilt of which is formed something like an H, the hand grasping the crossbar, which is generally double, while the side-bars extend on each side of the wrist. Some katars are made with five blades, which unite into one, but, by squeezing together the crossbars, diverge like the fingers of a hand when the thrust has been given. Other katars are made in sets of two, or even three, of diminishing sizes, the blades of the larger being hollow, and forming sheaths for the smaller. Some of the Southern Indian katars, known as 'death-givers,' are immense weapons, nearly two feet long in the blade; and the hilts are a mass of fantastic scroll-work and mythological monsters, the cobra with expanded hood figuring largely. There is also the 'bich'hwa,' or scorpion's sting, a doubly-curved dagger; the 'khanjar,' a larger form of the same; and the 'peshkabz,' or hunting-knife. But none of these elaborate weapons have about them the terribly 'business-like' look of the Khyber knife (ch'hura), with its ponderous single-edged, tapering blade, and plain ivory hilt.

The sword-stick, or 'gupti,' is of Indian origin. There is one form of it which was peculiar to chiefs and men of rank. The hilt of the sword, forming the handle of the stick, is crutch-shaped, and the owner, when lying on his divan, would have his arm resting upon this, so as never to be taken quite unarmed. It was called in Persian 'takiyah-i-zafar,' or 'cushion of victory.' Another form of concealed sword was made so

flexible as to be worn round the waist like a girle.

The swords of Hindustan are of endless variety in size and shape, the most common being the 'tegha' and 'talwar,' broad much-curved blades, wrongly styled scimitars, the real scimitar being a clumsy chopper-like weapon, nearly straight, and widening to the point. There is the 'khanda,' a heavy straight sword with basket-hilt, like the Scottish claymore. The khanda was an object of worship to the Rajputs, precisely as to the Scythians. The 'pata,' or gauntlet sword, much used by the Mahrattas, was a development of the 'katar,' having a long rapier blade, often of Spanish make, and a cylindrical hilt, into which the arm was passed to the elbow. The Persian sword, however, was valued above all others, and particularly those of Khorassan. These are the real 'Damascus blades,' the damascening being produced by the crystallisation of the steel. Connoisseurs recognise ten different varieties of watering or 'janhar,' and the most incredible prices have been given for fancy specimens. In Burnes' Visit to the Court of Sind, he says: 'I have had in my hand a plain blade which had cost them [the Amirs] half a "lac of rupees" [in that day about five thousand pounds]. Such swords as these often bear long inscriptions in gold inlaying, such as: "I am the produce of Persia, of ancient steel and water. When a brave man wields me, a hundred thousand Hindus will perish by my edge." There is a very singular sword in the South Kensington collection, composed of two very thin blades, with half-hilts, which are made by a series of catches on the inner side to unite and form a single weapon. From the great beauty of the ornaments and mounting, it was probably made by some renowned armourer for presentation. But the great brittleness of these swords makes them unfit for use by Europeans, who would shiver them to pieces by a 'swashing blow,' while the Oriental employs their razor edge only for the 'drawing' cut.

The Nepalese 'kukri,' or heavy-curved knife, with the edge on the inner side, is familiar by name to readers of the accounts of our 'little wars,' in which the Ghoorka infantry have taken part. But there is another Nepalese weapon, the 'kora,' the most strangely-shaped sword ever used, which, starting from the hilt about an inch and a half wide, when near the end turns at right angles and expands to six inches. The late Jung Bahadur, a noted expert at all Eastern arms and exercises, was able to decapitate a bullock with one blow of the kora.

There is a weapon known as the 'crow's beak,' which was formerly much in use among men of rank in Persia and North India. It was a horseman's weapon, and consisted of a broad curved dagger-blade, fixed at right angles to a shaft, pickaxe fashion. The shaft encloses a dagger, unscrewing at the butt end. This concealed dagger is a very common feature of Indian arms, and especially of the battle-axes of Persia.

The club, or mace, was probably the first, as it is the most universal weapon, and every nation would seem to have some form peculiar to itself. The Maori spent years of labour in grinding to shape his battle-dore-like 'merai' out of jade

or greenstone; the New Britain savage makes a hole through a granite pebble by dropping water on it while hot, and thus forms the head of his club; the Fijian found ready to his hand a tree, whose evenly radiating roots he trimmed into an exact likeness of the medieval 'morgenstern,' wherewith the Swiss battered down the Austrian ranks at Sempach. The mace of the Persian horseman was of steel, with a head formed of six or more radiating blades or ridges, and had often a basket hilt like a sword. The terrible Mahmud of Ghazni, like the knight of Border song, 'at his saddle-girth had a good steel sperthe, full ten pound weight and more,' and it was with this that he shattered the idol of Somnauth before the eyes of the horrified priests, strewing the temple floor with the jewels hidden within.

The bow as used by Asiatic horsemen assumes a curious shape. They were made of horn, generally buffalo horn, in two pieces, joined by a wooden centre, and when unstrung, had the form of a capital C, which enabled them to be hung over the arm on horseback. When strung—a difficult feat to those unused to them—they took the double curve of the antique bow as seen in the representation of Cupid. This was the 'Tatar's bow,' used by the Scythians, Parthians, and Persians, and, up to quite recent times, in India. It was drawn by the thumb alone, on which the archer wore a broad thick ring of horn, ivory, or cornelian, on whose edge the bowstring rested. The long-bow was also much in use among Indian infantry of the middle ages; but neither they nor any other Asiatics appear to have done such execution as the English archers of the same period. Bernier says, describing a battle between Aurungzebe and his brother Dara: 'They draw their arrows with a marvellous swiftness, one man being able to draw six of them before a musketeer can discharge twice; but, to say truth, their arrows do but little execution; more of them are lost in the air or broken on the ground, than hit.' The bow, in fact, requires more than any other weapon constant practice from childhood; and strong Englishmen of the present day are quite unable to use the bows of the half-human Mincopies of the Andamans. There is a curious example of a repeating crossbow in the United Service Museum, taken from the Taku forts, at which place the Chinese archers caused us heavy loss on the first occasion of the attack.

The many strange machines known as catapults, balistas, &c., had their counterparts all over Asia. It may be mentioned that the last instance of the use of the catapult in Europe was at the great siege of Gibraltar, where one was built, by order of General Elliott, to 'lob' shells into a part of the Spanish works too close to allow the guns to depress enough. But when cannon and muskets had once come into use, they were soon adopted everywhere. The great gun of Bijapur was cast in 1549 at Ahmednagar. It is twenty-eight inches in diameter of bore, and weighs over forty tons; and as the two places are distant nearly two hundred miles as the crow flies, it would be interesting to know how it was transported. It was used in several battles by the Mogul emperors, sacks of copper coins being fired from it. It was named Malik-i-Maidan, or 'the monarch of the field.' There was a gun at Dacca

thirty-six feet long, and weighing some thirty tons, made of wrought-iron bars laid together like the staves of a cask, and hooped with iron rings. Its bore was about fifteen inches. This gun was worshipped by the natives of Dacca; but about 1780, the island on which it lay was washed away, and it disappeared in the Ganges. The celebrated fort of Asirgarh had a gun of about the same calibre, which the natives believed capable of pitching a four-hundred-pound ball fourteen miles. It was a common practice with Eastern armies to cast their cannon before the place besieged, so as to avoid the difficulties of transport. In 1838, at the siege of Herat by the Persians, Mahmoud Shah had a heavy bronze gun cast in his camp; and when the siege was raised, the gun was sawn to pieces, and taken back to Teheran. The most celebrated guns of this sort are the 'kemaliks' of the Dardanelles, huge bronze howitzers, some of them over two feet in calibre. At the passage of the Dardanelles by Sir J. Duckworth's fleet in 1806, the ships suffered heavily from these seemingly antiquated monsters, the range being short. One shot killed and wounded twenty-five men, and an eighty-gun ship was all but sunk by an eight hundred pound stone ball. At the siege of Rhodes, the Turks constructed mortars by hollowing out cavities in the solid rock at the proper angle; and in the arsenal at Malta is a trophy of the long and glorious defence of Valetta, in a Turkish gun, about a six-pounder, composed of a copper tube, coiled over with strong rope, and 'jacketed' with raw hide. In the same collection are some antique 'quick-firers,' breech-loaders, with small bores and immensely long barrels, like punt guns. The Malay pirates put great trust in the long brass swivel guns called 'lela'; and in Borneo, these lelas were used as a kind of currency, large sums being estimated in guns. The Chinese cast excellent bronze guns (there is a fine specimen of them in Devonport Dockyard); but so little did they understand gunnery, that in the so-called 'Opium War,' the forts of the Boeca Tigris, defending the Canton river, had the guns built immovably into the walls. The Sikh gunners opposed to us in the two Punjab wars, though they loaded with amazing recklessness, shovelling in the powder from open boxes, stuck to their guns to the last. The blood of the first man killed was smeared on the gun, and the whole detachment died beside it, sooner than retreat.

Eastern muskets and matchlocks are remarkable for their great length of barrel, which is necessary to consume the large charge of weak, slow-burning powder. The 'Damascus' or 'laminated steel' twist barrels were brought to a high state of perfection in the East long before our gun-makers adopted the plan. The same gorgeous ornamentation was applied to firearms as to swords, 'armes de luxe' being made for chiefs, in which even the bands attaching the barrel to the stock were of massive gold, and the muzzle cased in gold and set with jewels, the foresight being sometimes a diamond, in anticipation of a recent patent. Skilful marksmanship has always been highly valued in India. Akbar the Great was a noted shot, proving the muskets with his own hands, so that it may be guessed that there was not much 'scamping' done in the royal workshops. Bernier, however, says of Aurung-

zebe's infantry: 'Their musketeers be pitiful men, afraid of burning their eyes or singeing their great beards, but most of all, lest some Djinn or evil spirit burst their musquet.'

CASKS CUT FROM THE TREE.

Few objects are more familiar than the common cask or barrel; yet few people have probably been at pains to consider the skill and ingenuity which have succeeded in bringing to perfection an invention as scientific as beneficial all the world over; and probably fewer still are conversant with the brain-power and time which have been expended in attempts to produce machinery which shall at the same time cheapen and expedite the manufacture of these well-known and useful contrivances. Barrels are no new thing; as far back as the time of Pliny they were in use, and that author mentions the Alpine valleys as the locality of their invention.

The trade readily divides itself into two great classes—the wet and dry manufactures; or casks designed to hold liquids, or dry goods. A third subdivision, known technically as 'white cooperage'—that is, wooden tubs, churns, pails, and other even-staved vessels—may be added.

When it is considered that tight casks have not merely to withstand the pressure of the contained liquid, but frequently also that of gases, arising from fermentation of such liquid, in addition to the handling and rough usage to which they are at all times liable, it will be readily understood how important are sound materials and workmanship in their construction.

A cask is a double conoid—namely, having its greatest diameter—technically known as the 'bulge' or 'belly'—at its centre; and this being borne in mind, the complex shape of each stave will be at once appreciated. Not only is the stave curved lengthways to form the 'bulge,' but crossways it is similarly made to form part of the circumference of the cask; whilst the edges must receive the exact bevel to fit those on either side along their entire length. The two processes known as 'chiming' and 'crozing,' which consist in finishing the ends for receiving the heads, yet remain to be performed. The 'chime' is the bevel formed on the extremity of the staves; and the 'croze' is the groove into which the ends or heads fit. Hooping, generally with iron bands, completes the manufacture of a cask.

Having thus sketched in brief outline the routine in vogue in the cooper's trade for manufacturing casks, we pass to consider as concisely as possible Mr Oncken's invention for producing staveless casks direct from the tree. Mr Oncken aims at turning out casks from one piece of wood—the body of the cask to be formed of one long single stave; the ordinary shape—that is, the double conoid—being retained. The method of preparing the body of the cask may be likened to sharpening a lead-pencil by a pocket sharpener, the shaving produced forming the staves of the cask.

The stem of a tree—poplar is frequently chosen—is first cut into lengths corresponding to the size of the cask. These lengths are then boiled

for two or three hours in a closed vessel, a current of electricity being passed through the water the whole time. The chemical action thus produced in combination with the prolonged boiling gives to the wood the necessary softness, and enables the subsequent cutting process to be performed without difficulty in a machine rotating the log in the same manner as the ordinary lathe, whilst advancing it towards a broad block fixed on a frame, having a slot in it similar to that of the common joiner's plane. As the trunk of the tree is revolved against the block, a continuous sheet of wood is cut of any desired thickness, and drawn out flat by hand on to a table at the rear of the machine. The sheets are then passed through a grooving-machine, which cuts the 'croze' or groove in which the head is eventually fitted. Another machine seizes the sheet between two arms, and by the means of knives, cuts a series of mortises or slots round the sides, giving it when made up the desired conical shape. Eventually, the sheet reaches the cooper, who rolls it into cylindrical form, drives on the hoops, and renders it a perfect barrel, after drying in a special apparatus.

The invention above detailed has safely passed the experimental stage, and is already in full practical operation at Merxem, in Germany, where Mr Oncken has started a factory, and is busily engaged in turning out his staveless casks.

When it is considered how numberless are the quantities of casks in daily use in every part of the globe, and the innumerable purposes to which they are devoted, hardly a trade or industry being carried on without them, the wide field open to improved and economical means of production of such indispensable necessities of civilisation, will be readily appreciated.

'HOME, SWEET HOME.'

'I'm going home, I'm going home!'

A ragged urchin cried one day;

The blue sky looked a far-off dome,

As he pursued his homeward way.

I wondered if 'sweet home' to him

Had music's meaning soft and clear,

Those words that mock, or seem a hymn,

According to the list'ning ear.

The urchin's voice was jubilant;

And yet I judged his home must be

Where daily toil kept off grim want,

Or struggled with chill poverty.

But if the lamp of love burns bright

Young hearts to warm, and cheer, and bless,

'Tis still 'sweet home' where day and night

Is felt some human happiness.

A palace home without love's spell

Can only be a stately Inn,

Though mortals are constrained to dwell,

Its cheerless, sheltering walls within,

And dream, with undefined desire,

Of something which they do not know,

Of peace to which their hearts aspire,

Which only love can here bestow!

CAMILLA CROSLAND.

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